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November 18, 2005

VIA EMAIL

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Dear Mr. Gallagher:

The American Chemistry Council Phthalate Esters Panel (Panel) submits these comments to the Washington State Department of Ecology (Ecology) on its re-filed Proposed Rule on Persistent Bioaccumulative Toxins (PBTs) regulation WSR 05-20-043. The Panel consists of the major U.S. producers and a processor of phthalate esters.

Ecology's proposed list of PBT chemicals includes two phthalate esters, diisodecyl phthalate (DIDP) and di-n-hexyl phthalate (DnHP). For the reasons stated in these comments, the Panel strongly believes these phthalates are not PBT chemicals and should not be included on the proposed PBT list.

The Panel would be pleased to provide any additional information to Ecology that would assist it in evaluating the phthalate esters. If you have questions, please call Marian K. Stanley, Manager of the Phthalate Esters Panel, at 703-741-5623 or e-mail her at [Marian\\_St Stanley@americanchemistry.com](mailto:Marian_St Stanley@americanchemistry.com).

Sincerely yours,

A handwritten signature in blue ink that reads "Courtney M. Price". The signature is written in a cursive, flowing style.

**BEFORE THE WASHINGTON STATE  
DEPARTMENT OF ECOLOGY**

**COMMENTS OF THE  
PHTHALATE ESTERS PANEL OF THE AMERICAN CHEMISTRY COUNCIL  
ON THE RE-FILED PROPOSED RULE ON PERSISTENT BIOACCUMULATIVE  
TOXINS REGULATION IN WASHINGTON STATE**

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Proposed Rule on Persistent Bioaccumulative Toxins  
Regulation in Washington State, Chapter 173-333 WAC,  
WSR 05-20-043 (filed September 29, 2005).

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## EXECUTIVE SUMMARY

The American Chemistry Council Phthalate Esters Panel (Panel) submits these comments to the Washington State Department of Ecology (Ecology) on its re-filed Proposed Rule on persistent bioaccumulative toxins (PBTs) regulation in Washington State. Ecology proposes to include two phthalate esters (phthalates) on its list of PBT chemicals: di-isodecyl phthalate (DIDP) and di-n-hexyl phthalate (DnHP). The Panel, which consists of the major U.S. producers and a processor of phthalates, strongly believes that these phthalates are not PBT chemicals and should not be included on the PBT list.

The Panel supports and incorporates by reference the general comments being submitted to Ecology by the American Chemistry Council. These comments provide phthalate-specific information, as follows:

- Under Chapter 173-333 WAC, chemicals may be included on the PBT list only if they satisfy each of the criteria for persistence, bioaccumulation and toxicity. DIDP and DnHP do not satisfy these three criteria, and therefore cannot be included on the PBT list.
- The data demonstrate that DIDP and DnHP are not of bioaccumulative concern. Because they are readily metabolized and excreted by fish and mammals, they do not accumulate in tissues. Traveling up the food chain, higher molecular weight phthalates, including DIDP and DnHP, decrease in tissue concentration with increasing trophic position (i.e., biodilute) rather than biomagnify.
- DIDP and DnHP are not persistent. The data relied upon by Ecology to characterize DIDP as persistent are incorrect and these phthalates are readily biodegraded, and so do not persist in the environment.
- DIDP and DnHP do not pose ecological toxicity concerns. The higher molecular weight phthalates, including DIDP and DnHP, are not toxic to aquatic organisms at levels up to and including their solubility limits.
- DIDP and DnHP pose low concern for human toxicity. The extent of Ecology's support for concluding that these phthalates meet the criteria for toxicity is "The NTP-CERHR . . . judged that the scientific evidence was sufficient to conclude that DIDP and DnHP are developmental toxicants that could adversely affect human development, if exposure levels were sufficiently high." For DnHP this statement is not correct; NTP-CERHR, in fact, did not reach a conclusion regarding the potential for DnHP to adversely affect human development or reproduction. For DIDP, NTP-CERHR reached only a qualified conclusion stating that DIDP could adversely affect human development only "if the levels of exposure were sufficiently high." NTP-CERHR exposure estimates show that conservative estimates of exposure levels are more than 1000-fold lower than the no effect levels for these phthalates, and are therefore not "sufficiently high" to pose a significant risk to human health. Indeed, NTP-CERHR itself found minimal to negligible concern for human developmental or reproductive toxicity from DIDP.

Thus, DIDP and DnHP are not PBTs. Because they do not meet the criteria for Washington State's PBT list, Ecology should not include them in the PBT list.

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## INTRODUCTION

The American Chemistry Council Phthalate Esters Panel (Panel) submits these comments to the Washington State Department of Ecology (Ecology) on its re-filing of a proposal to adopt a new rule, Chapter 173-333 WAC, the persistent bioaccumulative toxins regulation.<sup>1</sup> In its December 2000 proposed approach,<sup>2</sup> Ecology proposed to list four phthalates (butyl benzyl phthalate, di-n-butyl phthalate, di (2-ethylhexyl) phthalate and di-n-octyl phthalate) as persistent, bioaccumulative and toxic (PBT) chemicals. In response to public comments and after further evaluation of the science, Ecology no longer includes those four phthalates on the proposed PBT list. The Panel, which consists of the major U.S. producers and a processor of phthalate esters,<sup>3</sup> applauds Ecology's recognition that these four phthalates are not persistent, bioaccumulative and toxic, and its subsequent decision not to list these phthalates as PBT.

In its re-filed Proposed Rule, Ecology proposes to include two other phthalates on the PBT list: di-isodecyl phthalate (DIDP) and di-n-hexyl phthalate (DnHP). For a substance to be listed as PBT it must satisfy all of the criteria for persistence, bioaccumulation and toxicity listed under WAC 173-333-320. If a chemical does not meet *all* of these criteria, it cannot be listed as PBT.<sup>4</sup> For the reasons explained in these comments, DIDP and DnHP are not PBT chemicals, do not meet the criteria for listing, and therefore should not be included in the list of PBT chemicals.

Part I of these comments explains that the data relied upon by Ecology to categorize DIDP as bioaccumulative are erroneous and that the science demonstrates that phthalates are readily metabolized and excreted by fish, birds and mammals, and therefore do not accumulate in tissues. Moving up the food chain, higher molecular weight phthalates, including DIDP and DnHP, decrease in tissue concentration with increasing trophic position (i.e., biodilute) rather than biomagnify.

Part II explains that DIDP and DnHP are not persistent. The data relied upon by Ecology to characterize DIDP as persistent are incorrect and these phthalates are readily biodegraded, and so do not persist in the environment.

Part III explains that DIDP and DnHP do not pose ecological toxicity concerns. Higher molecular weight phthalates, including DIDP and DnHP, are not toxic to aquatic organisms at levels up to and including their solubility limits.

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<sup>1</sup> Persistent Bioaccumulative Toxins Regulation, WSR 05-20-043 (filed September 29, 2005). Available at: <http://www1.leg.wa.gov/documents/wsr/2005/20/05-20-043.htm>.

<sup>2</sup> Proposed Approach to Screen and Prioritize PBTs, in Washington State, in *Proposed Strategy to Continually Reduce Persistent, Bioaccumulative Toxins (PBTs) in Washington State*. Washington State Department of Ecology, Publication #00-03-054, December 2000. (Hereinafter "Proposed Approach"). Available at: <http://www.ecy.wa.gov/biblio/0003054.html>.

<sup>3</sup> The members of the Panel are: BASF Corporation, Eastman Chemical Company, ExxonMobil Chemical Company, Ferro Corporation and Teknor Apex Inc.

<sup>4</sup> WAC 173-333-320(2).

Part IV explains that DIDP and DnHP pose low concern for human toxicity. The extent of Ecology's support for concluding these phthalates meet the criteria for toxicity is "The NTP-CERHR [National Toxicology Program Center for the Evaluation of Risks to Human Reproduction] . . . judged that the scientific evidence was sufficient to conclude that DIDP and DnHP are developmental toxicants that could adversely affect human development, if exposure levels were sufficiently high." For DnHP this statement is not correct; NTP-CERHR, in fact, did not reach a conclusion regarding the potential for DnHP to adversely affect human development or reproduction. For DIDP, NTP-CERHR reached only a qualified conclusion stating that DIDP could adversely affect human development only "if the levels of exposure were sufficiently high." NTP-CERHR exposure estimates show that conservative estimates of exposure levels are more than 1000-fold lower than the no effect levels for these phthalates, and are therefore not "sufficiently high" to pose a significant risk to human health. Indeed, NTP-CERHR itself found minimal to negligible concern for human developmental or reproductive toxicity from DIDP.

The Panel would be pleased to provide any additional information to Ecology that would assist it in evaluating DIDP and DnHP. For the reasons stated herein, the Panel strongly believes that phthalate esters should not be characterized as PBTs and should not be included on the Washington PBT candidate list.

#### I. DIDP AND DNHP ARE NOT BIOACCUMULATIVE

Under the Proposed Rule, a chemical meets the criterion for "bioaccumulation" if, based on credible scientific information, it has a bioconcentration factor (BCF) or bioaccumulation factor (BAF) in aquatic species greater than 1000 or, in the absence of such data, a log-octanol water partition coefficient ( $\log K_{ow}$ ) greater than five.<sup>5</sup> To support its conclusion that DIDP is bioaccumulative, Ecology relies on a BCF value of 4000 reported in a 2003 European Chemicals Bureau (ECB) assessment of the health risks associated with DIDP.<sup>6</sup> However, the ECB's BCF value is incorrect because it is based on radioactivity data that cannot be correlated to parent test material. Ecology supports its listing of DnHP as bioaccumulative by citing a BCF value of 1100 calculated using the BCFWIN program of the EPA's PBT Profiler. Ecology's evaluation of these two phthalates' bioaccumulative potential does not take into consideration data which show that phthalates are readily metabolized by fish, birds and mammals, and do not biomagnify as they travel through a food web, but instead decrease in concentration as they move from lower to higher trophic levels. Consequently, Ecology's conclusion that DIDP and DnHP are bioaccumulative is incorrect.

The BCF data relied upon by Ecology to categorize DIDP as bioaccumulative are based on a study that used total radioactivity to measure bioconcentration. The total radioactivity method typically overestimates BCF values because it fails to distinguish between

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<sup>5</sup> WAC 173-333-320(2)(b).

<sup>6</sup> Summary Technical Background Information for the Proposed PBT List. Washington State Department of Ecology, October 2005, page 48. (Hereinafter "Technical Information Summary"). Available at: [http://www.ecy.wa.gov/programs/eap/pbt/rule/docs/Summary-TechnicalBackgroundInformationforProposedPBTList\(October2005-Bradley\).doc](http://www.ecy.wa.gov/programs/eap/pbt/rule/docs/Summary-TechnicalBackgroundInformationforProposedPBTList(October2005-Bradley).doc).

the parent test material and metabolic products. Indeed, this was acknowledged by the ECB report, which, as quoted by Ecology,<sup>7</sup> states:

The use of BCF values based on total radioactivity may give an overestimation of the BCF due to the fact that the metabolism of DIDP was not taken into account as both <sup>14</sup>C-DIDP and any <sup>14</sup>C-labeled metabolites of DIDP were measured (including <sup>14</sup>C built into the tissue of the organism in e.g. fatty acids). (ECB, 2003).

ECB also speculated that the test system with mussels may have underestimated bioaccumulation because the measured concentration in the water phase was far above solubility, which may cause a significant fraction to be unavailable for uptake across the respiratory surface, thereby lowering bioavailability of the compound (ECB, 2003). On the other hand, super-saturated phthalates may form emulsions and micelles that adhere to the surface of the organism, and may also be ingested by the organism. As a result of these considerations, Gobas et al. (2003) stated “it is unclear to what degree BCFs determined at concentrations above the water solubility are representative of field conditions.”

In any event, because the total radioactivity method fails to differentiate parent material from metabolites, bioaccumulation study designs using this method tend to overestimate BCFs, and are not suitable for regulatory decision making (Gobas et al., 2003; Staples et al., 1997). This is especially true in cases such as this where the parent material has been shown to be readily metabolized, and data exist that are based on measured parent test material.

Recent data show that, contrary to assumptions based on calculated log K<sub>ow</sub> and BCF values, phthalate esters simply do not accumulate in tissues to a degree sufficient to satisfy criteria for being bioaccumulative, nor do they biomagnify in aquatic ecosystems. Mackintosh et al. (2004) conducted a field study to evaluate the biomagnification of selected high molecular weight phthalate esters, including DIDP, through eighteen marine species representing several trophic levels. The organisms evaluated by Mackintosh et al. included three primary producers (e.g., plankton and macroalgae), two filter feeders (mussel and oyster), two deposit feeders (clams), a crab, a starfish, eight fish species, and a sea duck. The authors concluded that the phthalate esters evaluated in their study do not biomagnify through the food-web, but rather decrease in tissue concentration with increasing trophic position, which is the opposite of biomagnification and may be termed biodilution or trophic dilution. Mackintosh et al. showed that lipid equivalent concentrations of the high molecular weight phthalate esters, including DIDP, declined significantly with increasing trophic level.

In a related study that also addresses the results from the Mackintosh et al. study, Gobas et al. (2003) discussed food-web bioaccumulation under field conditions. Gobas et al. defined “food-web bioaccumulation” as bioaccumulation by predator and prey organisms that occurs through exposure to a chemical from both the aqueous habitat and the diet. Thus, food-web bioaccumulation occurs when a lipid-normalized chemical concentration increases in

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<sup>7</sup> Summary of Ecology’s Review and Initial Responses to Public Comments on Proposed PBT Rule, Washington State Department of Ecology, September 2005, page 10, note 10. (Hereinafter “Response to Comments”).

organisms with increasing trophic level, to the top predator. Like Mackintosh et al., Gobas et al. concluded that phthalates do not biomagnify in food webs and that higher molecular weight phthalates (greater than 6-carbon alkyl chain length) in fact decrease in concentration from lower to higher trophic levels (biodilute). Gobas et al. also noted that this lack of bioaccumulation in the field is consistent with laboratory studies and modeling results.

Such biodilution is explained by the advanced metabolic capacities of higher organisms (Staples et al., 1997), which is illustrated by experimental data showing that the metabolism and excretion of phthalates occurs quickly in fish<sup>8</sup>, birds<sup>9</sup> and mammals.<sup>10</sup> The biodilution that takes place at higher trophic levels is the exact opposite of the biomagnification that would be expected if phthalate esters had high bioaccumulation potential. As stated by Staples et al. (1997, pp. 720, 723):

[I]ncreased metabolism and reduced prey concentrations between trophic levels prevents biomagnification of phthalate esters. In fact, phthalate ester concentrations are expected to decrease as one proceeds up the foodchain.

...

Numerous experiments have shown that the bioaccumulation of phthalate esters in the aquatic and terrestrial foodchain is limited by biotransformation, which progressively increases with trophic level.

Thus, because phthalates are readily metabolized, they do not accumulate in tissues and do not biomagnify in the food chain. Consequently, the science demonstrates that DIDP and DnHP are not of concern for bioaccumulation. For this reason alone, they should be removed from Washington State's proposed list of PBT chemicals.

## II. DIDP AND DNHP ARE NOT PERSISTENT

Under the Proposed Rule, a chemical meets the criterion for "persistence" if credible scientific information indicates that the chemical has a half life greater than or equal to 60 days in water, soil or sediments.<sup>11</sup> Ecology's determination that DIDP meets this criterion is erroneous because the determination is based on the use of an incorrect chemical structure for DIDP and overly conservative assumptions regarding the solubility DIDP in water. In addition, data demonstrate that phthalates in general are readily biodegradable and therefore not persistent. While there are not direct experimental data for DnHP, read-across data indicate that it, like other phthalate esters, is not persistent.

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<sup>8</sup> Stalling et al., 1973; Barrows et al., 1980; Veith et al., 1980.

<sup>9</sup> Belisle, et al., 1975.

<sup>10</sup> Astill, 1989; Eigenberg et al., 1986; Foster et al., 1982; Ikeda et al., 1980; Tanaka et al., 1978; Williams and Blanchfield, 1975.

<sup>11</sup> WAC 173-333-320(2)(a).

Ecology's listing of DIDP (CAS No. 68515-49-1) as a persistent chemical is based, in part, on computer-modeled information that was developed using the EPA's PBT Profiler.<sup>12</sup> The PBT profiler model calculates media-specific half-life values based on CAS number and simplified (i.e., SMILES) chemical structure.<sup>13</sup> The structure for DIDP identified by EPA's PBT profiler model for CAS no. 68515-49-1 contains a quaternary carbon-branched structure in each of the two alkyl groups of the phthalate ester molecule. Structure-based computer models, like the PBT profiler, are programmed to recognize such quaternary carbon structures as persistent. However, DIDP in fact contains a mixture of branched alkyl chains that is not appropriately represented by the quaternary-branched structure type that the profiler associates with this CAS number. While the alkyl groups in DIDP are branched, the branching is present along the alkyl chain primarily as methyl groups, which do not contribute to the persistence of DIDP in the same manner as quaternary structures. Because the profiler model attributed quaternary structures to each alkyl chain, it significantly overestimated the half-life values of DIDP. Therefore, PBT profiler model estimates of DIDP half-life values should not be used in determining whether DIDP is a PBT chemical.

Ecology also refers to data from the European Chemicals Bureau (ECB, 2003), which estimated biodegradation rate constants and half-life values of up to 3000 days for DIDP.<sup>14</sup> This ECB estimate used overly-conservative assumptions that, like the PBT Profiler model, overestimate DIDP's persistence. As discussed below, DIDP has a very low water solubility, less than 1 µg/L. However, in its assessment, ECB calculated half-life values assuming DIDP is a freely-dissolving material. Adding the typical amount of material used in a ready biodegradation test (about 50 mg/L), when that material is of very low solubility, creates a sub-optimal situation in which the excess material is present as sorbed material and as an emulsion. This impedes the ability of the microorganisms to degrade that material, which directly impacts the measured biodegradation rate, resulting in unrealistically longer half-life values. Consequently, the biodegradation rates and half-life values calculated by ECB should not be used by Ecology to support a conclusion that DIDP is persistent.

Laboratory studies have shown that DIDP and di-hexyl phthalate (DHP)<sup>15</sup> underwent 67% and 80% biodegradation after 28 days, respectively (Exxon, 1995 and 1996; Staples, 1997). These studies were conducted following the internationally-recognized OECD 301F, Manometric Respirometry Biodegradation Test guideline, which measures loss of parent material, consumption of oxygen, removal of dissolved organic carbon, or formation of carbon dioxide. The 301 assays use low concentrations of test substance and low concentrations of unacclimated wastewater treatment plant sludge as microbial seed – conditions which do not readily promote biodegradation and so provide a stringent standard for biodegradation. Under the OECD guidelines, DIDP and DHP were classified as "readily biodegradable." In addition, as

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<sup>12</sup> Response to Comments at 9-10; Technical Information Summary at 47.

<sup>13</sup> See PBT Profiler Methodology at: <http://www.pbtprofiler.net/methodology.asp>.

<sup>14</sup> Technical Information Summary at 47.

<sup>15</sup> DHP is a mixture that contains both normal (i.e. DnHP) and isomeric dihexyl phthalate. The isomeric form is a conservative read-across to the normal form because, in the case of phthalate esters, branched aliphatics or aliphatic moieties are typically biodegraded at a lower rate than their normal counterparts.

explained in the Panel's 2001 comments on Ecology's previous list of proposed PBT chemicals, other phthalates, of both low molecular weight (e.g., butyl-benzyl phthalate (BBP) and dibutyl phthalate (DBP)) and high molecular weight (e.g., di(2-ethylhexyl phthalate (DEHP) and di-n-octyl phthalate (DnOP)), are also classified as readily biodegradable by the OECD 301F method.<sup>16</sup> These biodegradation test results indicate that DIDP and DnHP specifically, and phthalates generally, are readily biodegradable.

Moreover, an extrapolation approach developed by Robert Boethling of the U.S. EPA, and described in an Environment Canada (EC, 2003) guidance manual for categorizing persistent chemicals, results in a biodegradation rate constant for both DIDP and DHP of 0.1400 (k)(day<sup>-1</sup>), which yields water, soil, and sediment half-life values of 5 days, 5 days, and 20 days, respectively. These half-life values are clearly below the 60 day criterion used by Ecology to identify persistent substances, and demonstrate that DIDP is not a persistent chemical.

Although experimental data are not available for DnHP specifically, as discussed above, both low molecular weight and high molecular weight phthalates are readily biodegradable, which indicates that DnHP is as well. In addition, the OECD SIDS Initial Assessment Report (SIAR) for high molecular weight phthalate esters (HMWPE) discusses the use of read-across techniques for characterizing selected endpoints for phthalates. The OECD SIAR states: "It is shown that for the environment assessment, read-across can be performed with HMWPE having a backbone chain length longer than 5 carbons."<sup>17</sup> DnHP, though not evaluated in the SIAR, has a backbone chain of 6 carbons. Reading across with DEHP (6C), DnOP (8C), DINP (9C) and DIDP (10C), the conclusion is that DnHP is also highly biodegradable.

Because phthalates are readily biodegraded, they do not persist or accumulate in the environment. Consequently, the science demonstrates that DIDP and DnHP are not persistent chemicals and should not be included in Ecology's list of PBT chemicals.

### III. EXPOSURES TO DIDP AND DnHP DO NOT POSE ECOLOGICAL TOXICITY CONCERNS

The Proposed Rule defines "toxicity" as: "the degree to which a substance . . . can harm humans, plants or wildlife."<sup>18</sup> Under this definition, a substance meets the criteria for ecological toxicity if, based on credible scientific information, it has a reference dose or equivalent toxicity measure that is less than 0.003 mg/kg/day; or a chronic no observed effect concentration (NOEC) less than 0.1 mg/L or an acute NOEC < 1 mg/L.<sup>19</sup> Ecology's Technical

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<sup>16</sup> American Chemistry Council, (2001). Comments of the phthalate esters panel of the American Chemistry Council on the proposed approach to screen and prioritize PBTs in Washington State. Section III.

<sup>17</sup> OECD, SIDS Initial Assessment Profile: High Molecular Weight Phthalate Esters, Summary Conclusions, SIAM 19, October 19-22, 2004, page 2. Available at: <http://cs3-hq.oecd.org/scripts/hpv/>.

<sup>18</sup> Chapter 173-333-200 WAC.

<sup>19</sup> Chapter 173-333-320(2)(c) WAC.

Information Summary does not state that either DIDP or DnHP meet this criterion. The data indicate that, indeed, DIDP and DnHP pose no aquatic toxicity concerns because they are not toxic to aquatic organisms at levels up to and including their solubility limits in water.

DIDP and DnHP, like all phthalates with alkyl chains of 6 or more carbons in length, have very low solubility in water. Using the “three solubilities” approach, which correlates solubilities of phthalates in air, water and octanol against molar volume, and thereby avoids solubility measurement errors for the longer-chain phthalates, Cousins and Mackay (2000) determined the solubilities of DIDP and DnHP in water to be 0.00004 mg/L and 0.0009 mg/L, respectively.

Bradlee and Thomas (2003) performed an extensive review of available data on acute and chronic aquatic toxicity of phthalates, including DIDP and di-hexyl phthalate (DHP), and concluded that phthalates with alkyl chain lengths equal to or greater than 6 carbons in length are not toxic to aquatic organisms, even at concentrations at or above their solubility limit. As stated by Bradlee and Thomas: “Phthalate esters higher than about C6 pose no toxicity up to their aqueous solubility limits. The lack of toxicity for the higher phthalates is related to their relative insolubility in water and their ready metabolism by aquatic organisms, so that the critical body burden for toxicity is not reached.”

There are a few studies that report effects of higher molecular weight phthalates, including DIDP (Rhodes et al., 1995) and DEHP (Adams and Heidolph, 1985; Passino and Smith, 1987), in *Daphnia magna* at concentrations exceeding those phthalates’ solubility limits. However, as stated by Bradlee and Thomas (2003), “the weight of evidence overwhelmingly suggests that the toxicity was attributed to physical effects (surface entrapment) and not intrinsic toxicity.” Rhodes et al. (1995) agreed, stating: “[d]aphnid toxicity appears to be attributable to a large extent to physical entrapment and potentially to direct contact with the neat test chemical at the air/water interface.” The physical nature of phthalate toxicity above its solubility limit is supported by data showing that in the majority of studies with higher phthalates, daphnids showed EC/LC50s higher than solubility limits. (Bradlee and Thomas, 2003). Moreover, Brown et al. (1998), in a study that used a non-toxic solubilizer to prevent the formation of a surface layer that could entrap the daphnids, reported no acute or chronic *Daphnia* toxicity for DIDP and seven other high molecular weight phthalates at concentrations orders of magnitude above their solubility limits.

The above data demonstrate that phthalates with alkyl chains equal to or greater than 6 carbons in length, such as DIDP and DnHP, pose no ecological toxicity concerns. Therefore, it is appropriate that Ecology does not cite ecological toxicity as a basis for listing these phthalates as PBT.

#### IV. DIDP AND DnHP ARE OF LOW CONCERN FOR HUMAN HEALTH

Under the Proposed Rule, a chemical meets the “toxicity” criterion (other than ecological toxicity) if it is a carcinogen, a developmental or reproductive toxicant, or a neurotoxicant, or if it has a reference dose or equivalent toxicity measure that is less than 0.003

mg/kg/day.<sup>20</sup> Ecology correctly does not assert that DIDP or DnHP are carcinogens or neurotoxicants, and it correctly does not assert that these phthalates have a reference dose or equivalent toxicity measure that is less than 0.003 mg/kg/day. Rather, the extent of Ecology's statement about the toxicity of these phthalates is: "The NTP-CERHR . . . judged that the scientific evidence was sufficient to conclude that DIDP and DnHP are developmental toxicants and could adversely affect human development if exposure levels were sufficiently high."<sup>21</sup> For DnHP this statement is not correct; rather, NTP-CERHR stated: "The NTP judges the scientific evidence insufficient to reach a conclusion regarding the potential for DnHP to adversely affect human development or reproduction." (NTP-CERHR, 2003b). For DIDP, NTP-CERHR reached only a qualified conclusion stating that DIDP: "could adversely affect human development *if the levels of exposure were sufficiently high*." (NTP-CERHR, 2003a; emphasis added). Because of this qualifying language, NTP-CERHR's findings of potential toxicity are inextricably tied to exposure levels, which, as explained below, are not "sufficiently high" to indicate a potential for human effects.

The lowest No Observed Effect Level (NOEL) for DIDP reported by NTP-CERHR is 38 mg/kg/day.<sup>22</sup> In the case of DnHP, NTP-CERHR did not adopt a NOEL because, in the key study, fertility effects were observed in mice at all doses tested, including the lowest dose, about 380 mg/kg/day.<sup>23</sup> Thus, 380 mg/kg/day is a lowest observed effect level (LOEL). Typically, when a NOEL is not available, but a LOEL is, the NOEL is estimated by dividing the LOEL by 10. In this case, this conversion results in a NOEL for DnHP that is the same as that for DIDP – 38 mg/kg/day.<sup>24</sup>

These no effect levels are far higher than NTP-CERHR's estimated phthalate exposure levels. The NTP-CERHR reported that, while insufficient data were available to quantify exposures of the general U.S. population to these phthalates, it was reasonable to assume, based on their physicochemical characteristics, production volumes and use patterns, that exposures to DIDP and DnHP are lower than exposure to DEHP, which is estimated at 3-30 µg/kg/day.<sup>25</sup> Therefore, estimated exposures to DIDP and DnHP are, conservatively, more than

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<sup>20</sup> Chapter 173-333-320(2)(c) WAC.

<sup>21</sup> Technical Information Summary at 51.

<sup>22</sup> See Appendix II of NTP-CERHR (2003a).

<sup>23</sup> See NTP-CERHR (2003b) at 2.

<sup>24</sup> Note that even if these NOELs are divided by a very conservative safety factor of 1,000 to obtain a reference dose, the values of 0.038 mg/kg/day are still well above Ecology's toxicity criterion of 0.003 mg/kg/day.

<sup>25</sup> See Sections 1.2 of NTP-CERHR (2003a and 2003b). These estimates have been shown to be conservative by biomonitoring data for DEHP and DINP. Based on analogy to DINP exposures, urinary metabolite data indicate that the best estimate for ambient exposure to DIDP is ≤ 1 µg/kg/day (McKee et al., 2004). This exceedingly low exposure level is supported by another study which found that urinary levels of DIDP following exposure from the use of personal hygiene products were below detectable limits. (Stock et al., 2001; Stock personal communication). Urinary metabolite data for DEHP indicate that general population exposures are within or below the 3-30 µg/kg/day estimate (Kohn et al., 2000; McKee et al., 2004). As noted by NTP-CERHR, DnHP exposures likely are less.

1000 times lower than the no effect levels.<sup>26</sup> These values demonstrate that human exposures to phthalates are not “sufficiently high” to indicate significant concern for human toxicity.

NTP-CERHR itself found minimal or negligible concern for human developmental or reproductive toxicity for DIDP. About DIDP, NTP-CERHR stated: “The NTP concurs with the CERHR Phthalates Expert Panel that there is *minimal concern for developmental effects* in fetuses and children” and “The NTP concurs with the CERHR Expert Panel that there is *negligible concern for reproductive toxicity* in exposed adults” (NTP-CERHR, 2003a, emphasis added). In response to its own question, “Are current exposures to DIDP high enough to cause concern?” NTP-CERHR’s answer was “Probably not.” Again, NTP-CERHR reached no conclusion about the whether DnHP can adversely affect human reproduction or development.

Thus, the NTP-CERHR’s conclusions regarding the potential toxicity of DIDP and DnHP to humans are not sufficient to satisfy the relevant “toxicity” criteria under Chapter 173-333 WAC. In fact, the NTP-CERHR conclusions show that DIDP and DnHP are of low concern for human health. Therefore, DIDP and DnHP should not be included on the PBT list.

### CONCLUSION

For the reasons stated herein DIDP and DnHP are not PBT chemicals. To be listed as PBT, DIDP and DnHP must meet each of the criteria for persistence, bioaccumulation and toxicity. The science shows that these phthalates do not bioaccumulate, are not persistent, pose no risk of aquatic toxicity and are of low concern for human toxicity. Ecology therefore should not include DIDP and DnHP on the list of PBT chemicals.

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<sup>26</sup> Assuming the maximum exposure for DEHP, 30 µg/kg/day, the exposure margin is the NOEL (38 mg/kg/day) divided by estimated exposure, 0.03 mg/kg/day, which equals = 1267.

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